Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims **1-2** (canceled)

3. (currently amended) ~~The ICP source of claim 22 wherein:~~

An ICP source for producing a high-density inductively coupled plasma in a vacuum chamber for processing a semiconductor wafer therewith, the source comprising:

a dielectric chamber wall formed of at least one section of dielectric material and having a vacuum side and an atmospheric side;

a stationary peripheral ionization source configured to couple energy through the dielectric chamber wall in a ring-shaped distribution into the chamber, the peripheral ionization source including a low inductance RF antenna on the atmospheric side of the dielectric chamber wall and producing an annular magnetic field and a protective shield on the vacuum side of the dielectric chamber wall, the shield having slots therethrough and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and in the ring-shaped distribution into the chamber;

the peripheral ionization source having a segmented configuration of alternating high and low-radiation segments arranged in a ring, the segments being positioned and configured to couple power through the dielectric chamber wall into the chamber in an annular alternating high and low power distribution to produce a stationary ring-shaped plasma of alternating high and low density in the chamber; and

the high-transparency sections of the shield have a plurality of slots therethrough and low-transparency sections of the shield are electrically conductive and generally solid relative to the high-transparency sections.

4. (original) The ICP source of claim **3** wherein:

the shield is flat and circular, and the high-transparency sections thereof have a plurality of radially extending slots therethrough.

5. (withdrawn) The ICP source of claim **4** wherein:

the antenna has a segmented configuration and includes:

a plurality of spatially concentrated conductor segments thereof parallel to the dielectric chamber wall and perpendicular to the slots and aligned with the high-transparency sections of the shield, and

a plurality of spatially distributed conductor segments aligned with the low-transparency sections of the shield;

the high-radiation segments of the peripheral ionization source including the spatially concentrated conductor segments and the low radiation segments of the peripheral ionization source including the low-transparency sections of the shield.

6. (original) An iPVD apparatus having the source of claim **4**.

7. (withdrawn) The ICP source of claim **3** wherein:

the shield is generally cylindrical, and the high-transparency sections thereof have a plurality of axially extending slots therethrough.

8. (withdrawn) The ICP source of claim **7** wherein:

the antenna has a segmented configuration and includes a plurality of spatially concentrated conductor segments thereof parallel to the dielectric chamber wall and perpendicular to the slots and aligned with the high-transparency sections of the shield, and a plurality of spatially distributed conductor segments aligned with the low-transparency sections of the shield.

9. (withdrawn) The ICP source of claim **8** wherein:

at least some of the spatially distributed conductor segments are positioned to capacitively couple energy around the shield and into the chamber for plasma ignition.

10. (withdrawn) A plasma etch apparatus having the ICP source of claim **8**.

Claim **11** (canceled).

12. (currently amended) ~~The ICP source of claim 11 wherein:~~

An ICP source for producing a high-density inductively coupled plasma in a vacuum chamber for processing a semiconductor wafer therewith, the source comprising:

a dielectric chamber wall formed of at least one section of dielectric material and having a vacuum side and an atmospheric side;

a peripheral ionization source including an RF antenna on the atmospheric side of the dielectric chamber wall, and a protective shield on the vacuum side of the dielectric chamber wall, the shield having slots therethrough and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and into the chamber;

the peripheral ionization source having a segmented configuration of alternating high and low-radiation segments sections arranged in a ring and positioned to couple power through the dielectric chamber wall into the chamber to produce a plasma having an annular alternating high and low power distribution;

the antenna has a configuration segmented in such a way to lower its total inductance, the configuration being formed of at least one conductor having a plurality of windings each having alternating high and low-efficiency sections aligned with the sections of an adjacent winding to produce the high and low-radiation segments of the peripheral ionization source, the alternating sections of the windings being arranged in a ring and positioned to couple power through the dielectric chamber wall and into the chamber in the annular alternating high and low power

distribution, the high-radiation segments of the peripheral ionization source including the high-efficiency sections of the antenna and the low-radiation segments of the peripheral ionization source including the low-efficiency sections of the antenna; and

the high-efficiency sections of the antenna provide concentrated antenna current paths close to the dielectric chamber wall and the low-efficiency sections provide distributed antenna current paths.

13. (currently amended) ~~The ICP source of claim 11 wherein:~~

An ICP source for producing a high-density inductively coupled plasma in a vacuum chamber for processing a semiconductor wafer therewith, the source comprising:

a dielectric chamber wall formed of at least one section of dielectric material and having a vacuum side and an atmospheric side;

a peripheral ionization source including an RF antenna on the atmospheric side of the dielectric chamber wall, and a protective shield on the vacuum side of the dielectric chamber wall, the shield having slots therethrough and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and into the chamber;

the peripheral ionization source having a segmented configuration of alternating high and low-radiation segments sections arranged in a ring and positioned to couple power through the dielectric chamber wall into the chamber to produce a plasma having an annular alternating high and low power distribution;

the antenna has a configuration segmented in such a way to lower its total inductance, the configuration being formed of at least one conductor having a plurality of windings each having alternating high and low-efficiency sections aligned with the sections of an adjacent winding to produce the high and low-radiation segments of the peripheral ionization source, the alternating sections of the windings being arranged in a ring and positioned to couple power through the dielectric chamber wall and into the chamber in the annular alternating high and low power distribution, the high-radiation segments of the peripheral ionization source including the high-efficiency sections of the antenna and the low-radiation segments of the peripheral ionization source including the low-efficiency sections of the antenna; and

the high-efficiency sections of the antenna are formed of small cross-section conductors close to the dielectric chamber wall and the low-efficiency sections of the antenna are formed of relatively large cross-section conductors.

Claim **14** (canceled).

15. (currently amended) ~~The ICP source of claim 11 wherein:~~

An ICP source for producing a high-density inductively coupled plasma in a vacuum chamber for processing a semiconductor wafer therewith, the source comprising:

a dielectric chamber wall formed of at least one section of dielectric material and having a vacuum side and an atmospheric side;

a peripheral ionization source including an RF antenna on the atmospheric side of the dielectric chamber wall, and a protective shield on the vacuum side of the dielectric chamber wall, the shield having slots therethrough and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and into the chamber;

the peripheral ionization source having a segmented configuration of alternating high and low-radiation segments sections arranged in a ring and positioned to couple power through the dielectric chamber wall into the chamber to produce a plasma having an annular alternating high and low power distribution;

the antenna has a configuration segmented in such a way to lower its total inductance, the configuration being formed of at least one conductor having a plurality of windings each having alternating high and low-efficiency sections aligned with the sections of an adjacent winding to produce the high and low-radiation segments of the peripheral ionization source, the alternating sections of the windings being arranged in a ring and positioned to couple power through the dielectric chamber wall and into the chamber in the annular alternating high and low power distribution, the high-radiation segments of the peripheral ionization source including the high-efficiency sections of the antenna and the low-radiation segments of the peripheral ionization source including the low-efficiency sections of the antenna; and

the shield has a segmented configuration of alternating high and low-transparency sections arranged in a ring and positioned to facilitate the coupling of power through the dielectric chamber

wall in the annular alternating high and low power distribution into the chamber, the high-radiation segments of the peripheral ionization source having included therein the high-transparency sections of the shield and the low-radiation segments of the peripheral ionization source including the low-transparency sections of the shield, the high-efficiency sections of the antenna being aligned with the high-transparency sections of the shield and the low-efficiency sections of the antenna being aligned with the low-transparency sections of the shield.

16. (withdrawn) The ICP source of claim **15** wherein:

the dielectric chamber wall includes a plurality of discrete pieces of dielectric material, one for each of the high-radiation segments of the peripheral ionization source, one between each high-efficiency section of the antenna and the high-transparency section of the shield with which it is aligned.

Claims **17-23** (canceled).

24. (currently amended) ~~The ICP source of claim 23 wherein:~~

An ICP source for producing a high-density inductively coupled plasma in a vacuum chamber for processing a semiconductor wafer therewith, the source comprising:

a dielectric chamber wall formed of at least one section of dielectric material and having a vacuum side and an atmospheric side;

a stationary peripheral ionization source configured to couple energy through the dielectric chamber wall in a ring-shaped distribution into the chamber, the peripheral ionization source including a low inductance RF antenna on the atmospheric side of the dielectric chamber wall and producing an annular magnetic field and a protective shield on the vacuum side of the dielectric chamber wall, the shield having slots therethrough and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate

inductive coupling of RF energy from the antenna through the shield and in the ring-shaped distribution into the chamber;

the peripheral ionization source having a segmented configuration of alternating high and low-radiation segments arranged in a ring, the segments being positioned and configured to couple power through the dielectric chamber wall into the chamber in an annular alternating high and low power distribution to produce a stationary ring-shaped plasma of alternating high and low density in the chamber;

the antenna has configuration segmented in such a way to lower its total inductance, the configuration being formed of at least one conductor having alternating high and low-efficiency sections aligned to produce the high and low-radiation segments of the peripheral ionization source, the alternating sections being arranged in a ring and positioned to couple power through the dielectric chamber wall and into the chamber in the annular alternating high and low power distribution, the high-radiation segments of the peripheral ionization source including the high-efficiency sections of the antenna and the low-radiation segments of the peripheral ionization source including the low-efficiency sections of the antenna; and

the high-efficiency sections of the antenna are formed of small cross-section conductors close to the dielectric chamber wall and the low-efficiency sections of the antenna are formed of relatively large cross-section conductors.